AMENDMENTS TO THE CLAIMS

A listing of all claims and their current status in accordance with 37 C.F.R. § 1.121(c) is provided below.

1. (Currently Amended) A process for slurry polymerization and for separating hydrocarbon fluid from solid polymer particles and purge gas, [[said]] the process comprising:

polymerizing in a reaction zone at least one olefin monomer to produce a slurry comprising solid polymer particles and hydrocarbon fluid;

withdrawing a portion of the slurry from the reaction zone;

separating at least a majority of the hydrocarbon fluid from the solid polymer particles in an intermediate pressure zone as a vaporized hydrocarbon fluid stream;

condensing the vaporized hydrocarbon fluid stream in a condensing zone, whereby a condensed hydrocarbon fluid stream is formed;

transferring the solid polymer particles from the intermediate pressure zone to a purge zone in which a purge gas is passed through the solid polymer particles to remove entrained hydrocarbon fluid, thereby forming a mixed stream containing hydrocarbon vapor and purge gas;

transferring the mixed stream to a recovery zone where the purge gas and hydrocarbon fluid are separated to form a recovered purge gas stream and a recovered hydrocarbon fluid stream;

passing at least a first portion of the recovered purge gas stream from the recovery zone to the purge zone;

passing at least a first portion of the recovered hydrocarbon fluid stream from the recovery zone to a fractionation zone;

passing a second portion of the recovered hydrocarbon fluid stream as vapor from the recovery zone to the recycle zone;

transferring the condensed hydrocarbon fluid stream from the condensing zone to a recycle zone; and

transferring at least a majority of the condensed hydrocarbon fluid in the recycle zone to the reaction zone without fractionating the condensed hydrocarbon fluid.

2. (Previously Presented) The process of claim 1, comprising passing a second portion of the recovered purge gas stream from the recovery zone to a closed loop transfer zone.

3. (Previously Presented) The process of claim 1, comprising feeding fresh purge gas to an extrusion feed zone and refraining from feeding fresh purge gas to the purge zone.

4. (Cancelled).

5. (Cancelled).

6. (Previously Presented) The process of claim 1, further comprising transferring vapor from the recycle zone to the fractionation zone.

7. (Previously Presented) The process of claim 6, comprising transferring substantially no liquid from the recycle zone to the fractionation zone.

8. (Previously Presented) The process of claim 7, comprising transferring liquid hydrocarbon from the fractionation zone to a catalyst preparation zone.

9. (Original) The process of claim 1, wherein the recovered purge gas stream from the recovery zone is not flared.

10. (Original) The process of claim 1, wherein the recovered purge gas stream exiting the recovery zone contains less than 5000 ppm of hydrocarbon.

11. (Original) The process of claim 1, wherein the recovered purge gas stream exiting the recovery zone contains less than 1000 ppm of hydrocarbon.

12. (Original) The process of claim 1, wherein the recovered purge gas stream exiting the recovery zone contains less than 500 ppm of hydrocarbon.

13. (Original) The process of claim 1, wherein the recovered purge gas stream exiting the recovery zone is essentially free of hydrocarbon.

14. (Original) The process of claim 1, wherein the purge gas is nitrogen and the hydrocarbon fluid comprises a diluent.

15. (Currently Amended) An apparatus for slurry polymerization in a hydrocarbon fluid and for separating hydrocarbon fluid from solid polymer particles and purge gas, the apparatus comprising:

(a) a polymerization reactor in which one or more olefins are polymerized to form solid polymer particles in a hydrocarbon fluid;

(b) an intermediate pressure chamber adapted for the separation of hydrocarbon fluid from the solid polymer particles, the chamber having an inlet for receiving hydrocarbon fluid and solid polymer particles from the polymerization reactor, a polymer outlet for discharging solid polymer particles, and a gas outlet for discharging vaporized hydrocarbon fluid;

(c) a condenser fluidically connected to the gas outlet of the intermediate pressure chamber and adapted to condense the vaporized hydrocarbon fluid by heat exchange and without compression;

(d) a purge column fluidically connected to the polymer outlet of the intermediate pressure chamber, the purge column adapted to receive the solid polymer particles from the intermediate pressure chamber;

(e) a hydrocarbon/purge gas recovery unit adapted to separate hydrocarbon fluid from purge gas, the recovery unit fluidically connected to a top portion of the purge column and adapted to receive a fluid stream comprising purge gas and hydrocarbon fluid from the purge column;

(f) a recycle tank adapted to receive condensed hydrocarbon vapor from the condenser and to receive a second hydrocarbon fluid stream as vapor from the hydrocarbon/purge gas recovery unit;

(g) a pump and at least one conduit fluidically connected to a bottom portion of the recycle tank, wherein the pump and the at least one conduit are adapted to transport the condensed hydrocarbon fluid from the recycle tank to the reactor without transporting the condensed hydrocarbon fluid through a fractionation system;

(h) a vapor delivery conduit coupled to a top portion of the recycle tank and fluidically connected to a first fractionation column; and

(i) an extruder feed tank adapted to receive the solid polymer particles from the purge column.

16. (Previously presented) The apparatus of claim 15, comprising a fresh purge gas feed connected to the extruder feed tank.

17-19. (Cancelled).

20. (Previously Presented) The apparatus of claim 15, wherein the first fractionation column does not have a sidedraw.

21. (Previously Presented) The apparatus of claim 22, comprising a liquid delivery conduit from the second fractionation column to a catalyst preparation tank.

22. (Original) The apparatus of claim 20, further comprising a second fractionation column adapted to receive a top product from the first fractionation column.

23. (Cancelled).

24. (Original) The apparatus of claim 15, wherein the recovery unit is not connected to a purge gas flare.

25. (Currently Amended) A process for slurry polymerization and for separating hydrocarbon fluid from solid polymer particles and purge gas, said process comprising:

polymerizing in a reaction zone at least one olefin monomer to produce a slurry, comprising solid polymer particles and hydrocarbon fluid;

withdrawing a portion of the slurry from the reaction zone;

separating at least a majority of the hydrocarbon fluid from the solid polymer particles in an intermediate pressure zone as a vaporized hydrocarbon fluid stream;

condensing the vaporized hydrocarbon fluid stream in a condensing zone, whereby a condensed hydrocarbon fluid stream is formed;

transferring the condensed hydrocarbon fluid stream from the condensing zone to a recycle zone;

transferring the solid polymer particles from the intermediate pressure zone to a purge zone in which a purge gas is passed through the solid polymer particles to remove entrained hydrocarbon fluid, thereby forming a mixed stream containing hydrocarbon vapor and purge gas;

transferring the mixed stream to a recovery zone where the purge gas and hydrocarbon fluid are separated to form a recovered purge gas stream and a recovered hydrocarbon fluid stream;

passing at least a portion of the recovered purge gas stream from the recovery zone to the purge zone;

passing at least a portion of the recovered hydrocarbon fluid stream as vapor from the recovery zone to the recycle zone;

transferring vapor from the recycle zone to a fractionation zone; and

transferring hydrocarbon liquid from the recycle zone to the reaction zone without fractionating the hydrocarbon liquid.

26. (Cancelled).

27. (Previously Presented) The process of claim 25, comprising transferring substantially no liquid from the recycle zone to the fractionation zone.

28. (Original) The process of claim 27, further comprising transferring a minor portion of liquid hydrocarbon from the fractionation zone to a catalyst mud preparation zone, and transferring a major potion of the liquid hydrocarbon from the fractionation zone to the recycle zone.

29. (Original) The process of claim 25, wherein the recovered purge gas stream from the recovery zone is not flared.

30. (Original) The process of claim 25, wherein the recovered purge gas stream exiting the recovery zone contains less than 5000 ppm of hydrocarbon.

31. (Original) The process of claim 25, wherein the recovered purge gas stream exiting the recovery zone contains less than 1000 ppm of hydrocarbon.

32. (Original) The process of claim 25, wherein the recovered purge gas stream exiting the recovery zone contains less than 500 ppm of hydrocarbon.

33. (Original) The process of claim 25, wherein the recovered purge gas stream exiting the recovery zone is essentially free of hydrocarbon.

34. (Original) The process of claim 25, wherein the purge gas is nitrogen and the hydrocarbon fluid comprises a diluent.

35. (Original) The process of claim 25, wherein the recovered purge gas stream is at least partially used for providing a motive force to solid polymer particles which have already passed through the purge zone.

36. (Currently Amended) An apparatus for slurry polymerization in a hydrocarbon fluid and for separating hydrocarbon fluid from solid polymer particles and purge gas, the apparatus comprising:

(a) a loop polymerization reactor in which one or more olefins are polymerized to form solid polymer particles in a hydrocarbon fluid;

(b) an intermediate pressure chamber adapted to separate hydrocarbon fluid from the solid polymer particles, the chamber having an inlet for receiving hydrocarbon fluid and solid polymer particles from the polymerization reactor, a polymer outlet for discharging solid polymer particles, and a gas outlet for discharging vaporized hydrocarbon fluid;

(c) a condenser ~~fluidly~~ fluidically connected to the gas outlet of the intermediate pressure chamber, the condenser adapted to condense the ~~vaporized~~ flashed hydrocarbon fluid by heat exchange and without compression;

(d) a purge column ~~fluidly~~ fluidically connected to the polymer outlet of the intermediate pressure chamber and adapted to receive the solid polymer particles from the intermediate pressure chamber;

(e) a hydrocarbon/purge gas recovery unit adapted to separate hydrocarbon fluid from purge gas, wherein the recovery unit is fluidically connected to a top portion of the purge column and adapted to receive a fluid stream comprising purge gas and hydrocarbon fluid from the purge column;

(f) a recycle tank adapted to receive hydrocarbon liquid from the condenser and to receive hydrocarbon fluid from the hydrocarbon/purge gas recovery unit;

(g) a liquid delivery conduit fluidically connecting a bottom portion of the recycle tank with the polymerization reactor, wherein the fluidic connection between the recycle tank and the reactor does not include a fractionation column; and

(h) a vapor delivery conduit fluidically connecting a top portion of the recycle tank with a first fractionation column.

37. (Cancelled).

38. (Cancelled).

39. (Previously Presented) The apparatus of claim 36, further comprising a second fractionation column adapted to receive a top product from the first fractionation column.

40. (Original) The apparatus of claim 39, further comprising a liquid delivery conduit from the second fractionation column to a catalyst preparation tank.

41. (Original) The apparatus of claim 39, wherein the first and second fractionation columns do not have sidedraws.

42. (Cancelled).

43. (Original) The apparatus of claim 36, wherein the recovery unit is not connected to a purge gas flare.

44. (Previously Presented) The process of claim 1, comprising passing a second portion of the recovered purge gas stream from the recovery zone to an extrusion feed zone.

45. (Previously Presented) The apparatus of claim 15, wherein the extruder feed tank is configured to receive a portion of the purge gas stream exiting the recovery unit.

46. (Currently Amended) A method of processing effluent of a polymerization reactor, the effluent comprising hydrocarbon liquid and polymer solids, the method comprising:

separating a majority of the hydrocarbon liquid from the polymer solids in the effluent by flashing the majority of the hydrocarbon liquid to generate a hydrocarbon vapor;

transporting and condensing the hydrocarbon vapor to form a recovered hydrocarbon liquid;

transporting an equilibrium vapor of the recovered hydrocarbon liquid without compression to a fractionation system; and

recycling at least a portion of the recovered hydrocarbon liquid to the polymerization reactor without fractionating the recovered hydrocarbon liquid.

47. (Previously Presented) The method of claim 46, wherein recycling comprises transporting the recovered hydrocarbon liquid to a recycle tank and pumping the recovered hydrocarbon liquid from the recycle tank to the polymerization reactor.

48. (Previously Presented) The method of claim 46, comprising processing the equilibrium vapor in the fractionation system to generate a diluent substantially free of olefin for use in catalyst preparation and delivery.

49. (Previously Presented) The method of claim 46, comprising purging the polymer solids with a purge gas to remove residual hydrocarbon entrained in the polymer solids to form a first stream comprising the purge gas and the residual hydrocarbon.

50. (Previously Presented) The method of claim 49, comprising separating purge gas from the first stream to form a second stream comprising separated purge gas and a third stream comprising primarily hydrocarbon.

51. (Previously Presented) The method of claim 50, comprising transporting the second stream to the recycle tank or to the fractionation system, or a combination thereof.

52. (New) the method of claim 1, wherein the reaction zone comprises a loop reactor.